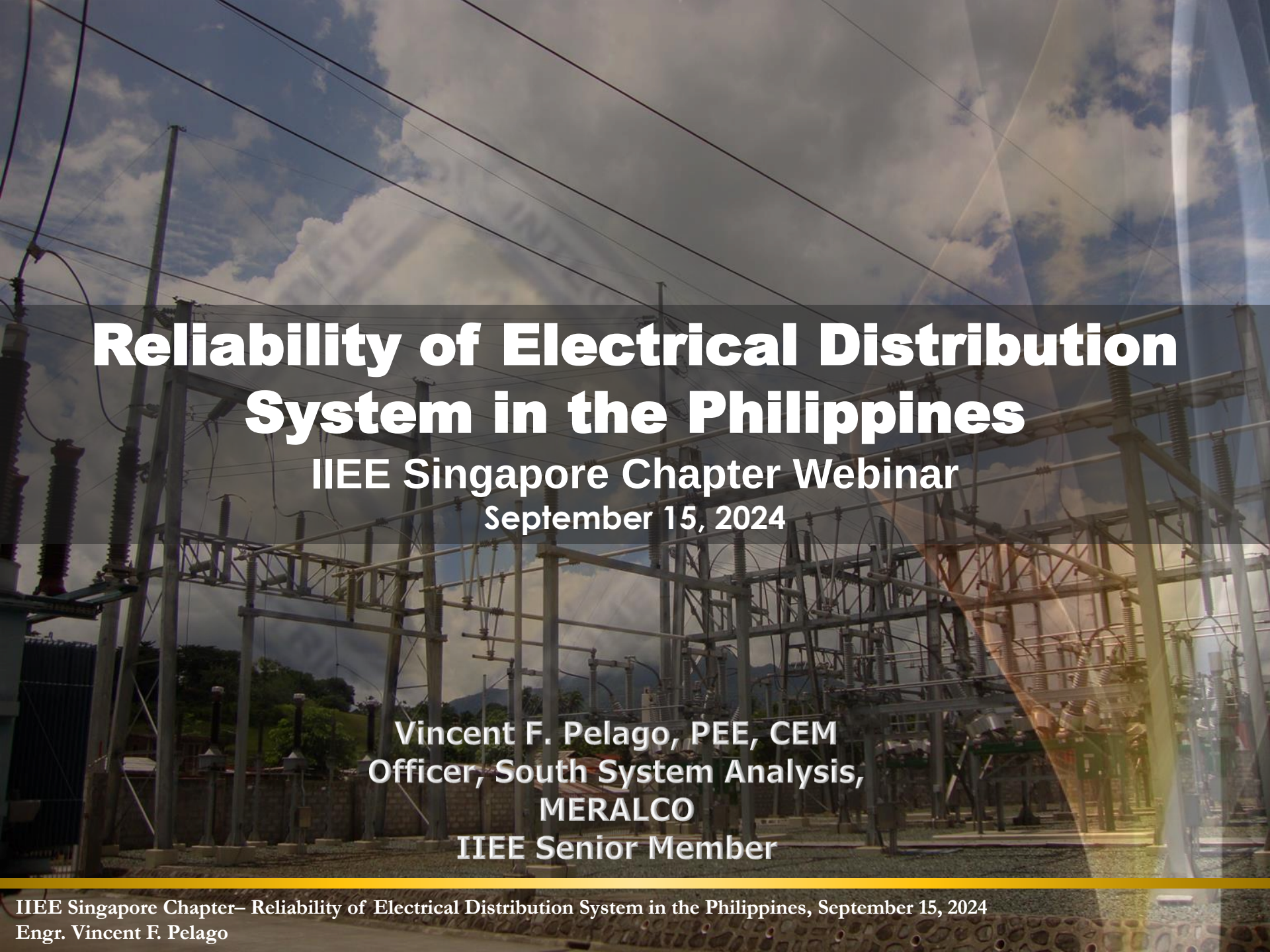


Reliability of Electrical Distribution System in the Philippines

IIEE Singapore Chapter Webinar

September 15, 2024

Vincent F. Pelago, PEE, CEM
Officer, South System Analysis,
MERALCO
IIEE Senior Member

About the Speaker

Vincent F. Pelago

- Officer, South System Analysis, Manila Electric Company (MERALCO)
- More than 21 years practicing electrical engineering.
- Professional Electrical Engineer, 2024
- Registered Electrical Engineer, 2021
- Certified Energy Manager (CEM), ASEAN Energy Management Scheme (AEMAS), 2013
- IIEE Senior Member, 2017
- 2022 - 2024 Chairman, IIEE Oplan Dagitab Committee
- 2021 Vice Chairman, IIEE Oplan Dagitab Committee
- 2020 Member, Executive Committee, IIEE Southern Luzon Region (SLR)
- 2019 National Chairman, IIEE Student Affairs Committee
- 2018 Deputy Governor, IIEE Southern Luzon Region
- 2016 & 2017 President, IIEE Southern Cavite Chapter
- 2016 Most Outstanding Chapter President Awardee, IIEE
- 2017 Most Outstanding Chapter President, IIEE SLR
- BS Electrical Engineering, Central Philippine University (CPU) 2001, Iloilo City

LUZON
NCR
1. MERALCO
CAR
2. BENECO
3. IFELCO
4. KAELCO
5. MOPRECO
6. ABRECO
REGION III
22. AEC
23. CEDC
24. CELCOR
25. OEDC
26. SEZ
27. SFELAPCO
28. TEI
29. AURELCO
30. NEECO I
31. NEECO II-Area 1
32. NEECO II-Area 2
33. PELCO I
34. PELCO II
35. PELCO III
36. PENELCO
37. PRESCO
38. SAJELCO
39. TARELCO I
40. TARELCO II
41. ZAMECO I
42. ZAMECO II
43. PAMES
REGION I
7. DECORP
8. LUECO
9. CENPELCO
10. INEC
11. ISECO
12. LUELCO
13. PANELCO I
14. PANELCO III
REGION II
15. CAGELCO I
16. CAGELCO II
17. ISELCO I
18. ISELCO II
19. NUVELCO
20. QUIRELCO
21. BATANELCO
REGION IV-A
44. FBPC
45. IEC
46. LEZ
47. BATELEC I
48. BATELEC II
49. FLECO
50. QUEZELCO I
51. QUEZELCO II
MIMAROPA
52. BISELCO
53. LUBELCO
54. MARELCO
55. OMECO
56. ORMECO
57. PALECO
58. ROMELCO
59. TIELCO
60. Banton
61. Concepcion
62. Corcuera
REGION V
63. ALECO
64. CANORECO
65. CASURECO I
66. CASURECO II
67. CASURECO III
68. CASURECO IV
69. SORECO I
70. SORECO II
71. FICELCO
72. MASELCO
73. TISELCO

VISAYAS
REGION VI
1. PECO
2. AKELCO
3. ANTECO
4. CAPELCO
5. CENECO
6. GUIMELCO
7. ILECO I
8. ILECO II
9. ILECO III
10. NONECO
11. NOCECO
REGION VII
12. BEZ
13. BICI
14. MECO
15. MEZ
16. VECO
17. BOHECO I
18. BOHECO II
19. CEBECO I
20. CEBECO II
21. CEBECO III
22. NORECO I
23. NORECO II
24. BANELCO
25. CELCO
26. PROSIELCO
REGION VIII
27. BILECO
28. DORELCO
29. ESAMELCO
30. LEYECO II
31. LEYECO III
32. LEYECO IV
33. LEYECO V
34. NORSAMELCO
35. SAMELCO I
36. SAMELCO II
37. SOLECO
38. MMPC

MINDANAO
REGION IX
1. ZAMCELCO
2. ZAMSURECO I
3. ZAMSURECO II
4. ZANECO
REGION X
5. CEPALCO
6. ILPI
7. BUSECO
8. CAMELCO
9. FIBECO
10. LANECO
11. MOELCI I
12. MOELCI II
13. MORESCO I
14. MORESCO II
REGION XI
15. DLPC
16. DANECO
17. DASURECO
18. DORECO
REGION XII
19. CLPC
20. COTELCO
21. COTELCO-PPALMA
22. SOCOTECO I
23. SOCOTECO II
24. SUKELCO
CARAGA
25. ANECO
26. ASELCO
27. SIARELCO
28. SURNECO
29. SURSECO I
30. SURSECO II
31. DIELCO
ARMM
32. LASURECO
33. MAGELCO
34. BASELCO
35. CASELCO
36. SIASELCO
37. SULECO
38. TAWELCO
39. Bumbaran

Presentation Outline

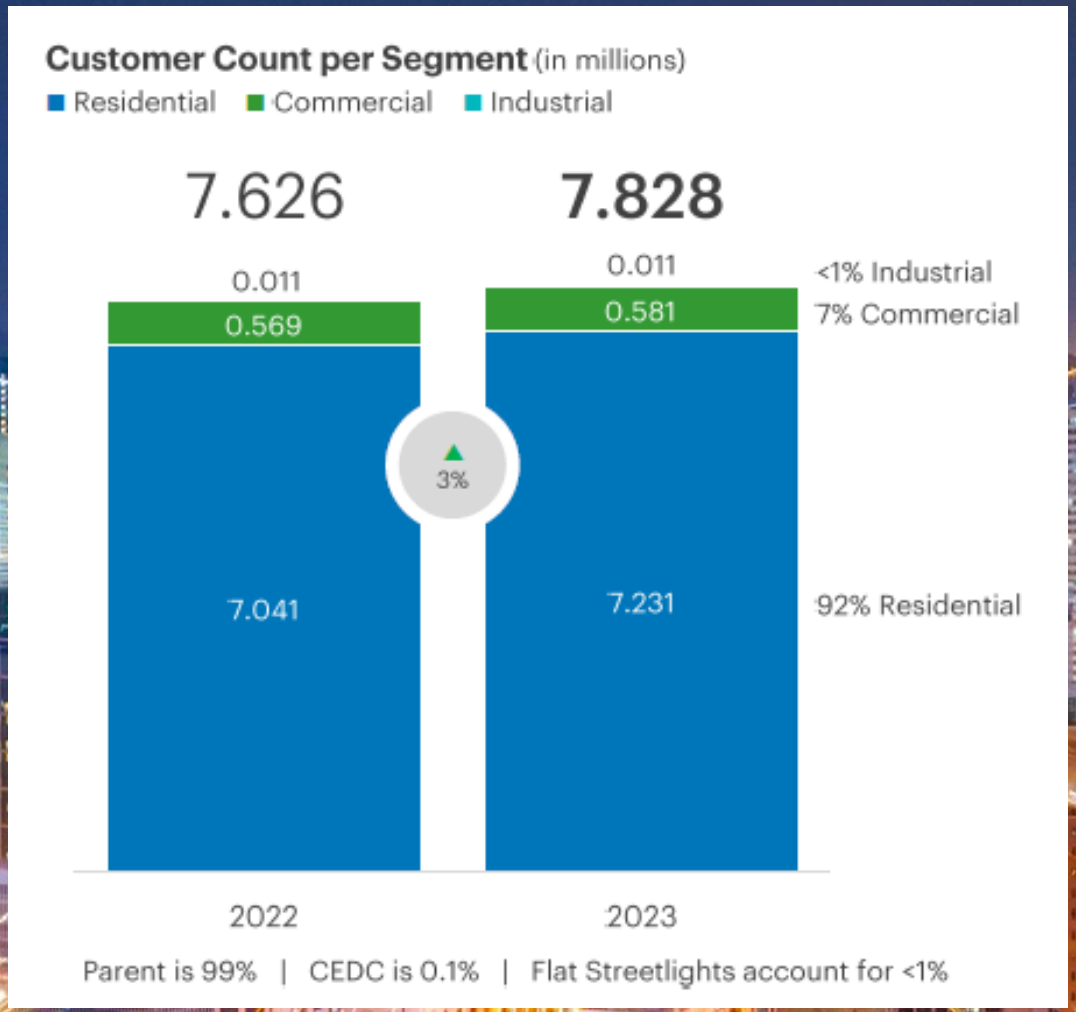
I. About Meralco
II. PBR and PIS Overview
III. Reliability Definition
IV. Reliability Standards as per PDC
V. Causes of Forced Interruptions
VI. Projects for Improvement of Reliability

I. About MERALCO

- The largest electric distribution company in the Philippines covering 39 cities and 72 municipalities, including Metro Manila
- 121 years in service in 2024
- Franchise area of over 9,685 km^2 covering the core of the country's industrial, commercial, and population centers
- Serves more than 7.8 million customers

Source: Meralco

I. About MERALCO

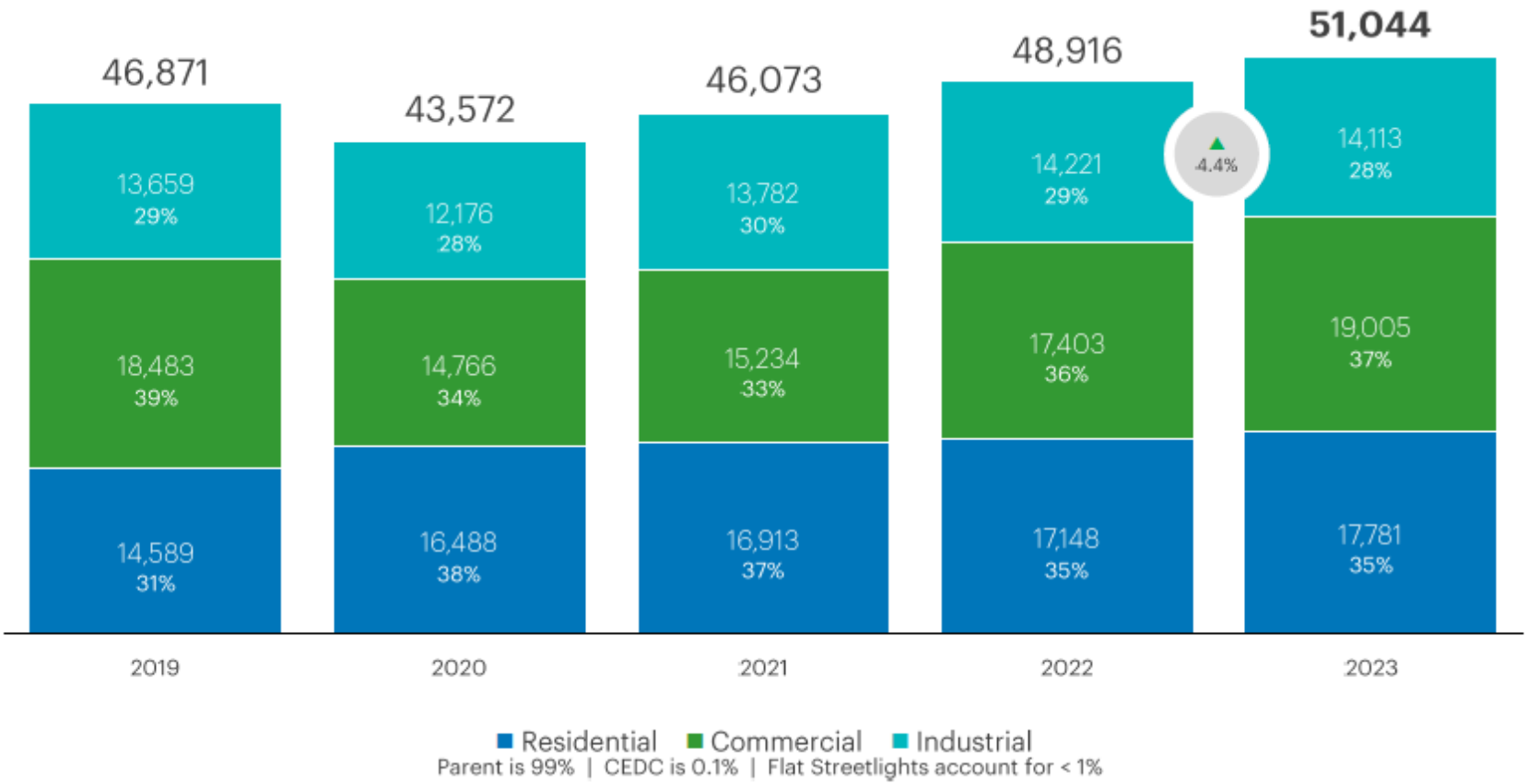


Source: Meralco

I. About MERALCO

FY 2023 **Consolidated Energy Sales** in GWh

Grew 4.4% vs. 2022 driven by sustained growth in Commercial and Residential segments



Source: Meralco

Meralco Substations

134 Substations, total capacity of 21,262 MVA (2022)

Source: Meralco

Meralco Circuits

19,557 kms primary circuit length (2022)

Source: Meralco

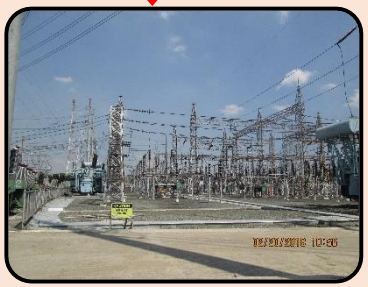
THE **POWER DISTRIBUTION SECTOR**

Transmission Facilities

Embedded Generators

Spot Market

Generation Plant



Delivery Point Substation

Sub-Transmission Lines

Distribution Substation

Distribution Lines

Metering Facilities

Large Industrial Companies

End Users/ Customers

I. PBR and PIS Overview

Performance-based Rate-Setting Methodology (PBR)

It is an internationally-accepted methodology which uses projections of operating and capital expenditures to enable the regulator to evaluate investment in facilities to meet customer requirements and prescribed service levels.

It also has a performance incentive scheme by which the regulator provides incentives and penalties to the utility to compel it to be more efficient and reliable, while maintaining reasonable rates and improving the quality of service to achieve pre-determined target levels.

Source: ERC

I. PBR and PIS Overview

BENEFITS OF THE PBR METHODOLOGY

The PBR Methodology is intended to bridge the gap between service quality and distribution cost. By allowing DUs to recover rates based on projected operating and capital expenditures, DUs are able to make the necessary investments to improve efficiency and service quality.

In the long run, these facilities will result in **more efficient** and **improved quality of service** which, in turn, will **lower electricity cost**.

Source: ERC

I. PBR and PIS Overview

Performance Incentive Scheme (PIS)

A scheme that rewards (or penalizes) a Regulated Entity to the extent that the actual level of performance, as measured by specific indices, exceeds (or is below) the target level of performance for each Regulatory Year

Source: ERC

I. PBR and PIS Overview

System-wide Performance Incentive Scheme (S-factor)

- Rewards or penalties through an adjustment of the Maximum Average Price

			Reward		Average	Penalty	
Performance Index	**Units**	**Weight**	**Level A**	**Level B**	**Level C**	**Level D**	**Level E**
System average interruption frequency index (SAIFI)	No.	**0.2**	6.34	6.97	7.61	8.25	8.88
Customer average interruption duration index (CAIDI)	Min.	**0.2**	132.22	144.39	156.56	168.73	180.90
Planned system average interruption duration index (planned SAIDI)	Min.	**0.15**	90.64	126.56	162.49	198.41	234.33
Probability of voltage levels falling outside prescribed limits	%	**0.05**	0.5%	0.85%	1.1%	1.45%	1.8%
System losses	%	**0.1**	7.74%	8.5%	-		
Average time to process applications for Regulated Distribution Services	Days	**0.1**	5.71	7.90	10.10	12.29	14.48
Average time to connect premises to the Regulated Distribution System	Days	**0.1**	2.43	3.55	4.66	5.78	6.89
Average time to answer calls at call centre	Seconds	**0.1**	9.81	13.55	17.30	21.04	24.78

Source: ERC

Meralco experience

III. Reliability

RELIABILITY – The probability that a System or Component will perform a required task or mission for a specified time in a specified environment. It is the ability of a power system to continuously provide service to its Customers.

100% power reliability means zero power interruption or outage, but this is impossible, even if the grid is 100% underground.

IV. Reliability Standards for DU as per Philippine Distribution Code (PDC)

3.3.2 Distribution Reliability Indices

3.3.2.1 The following distribution reliability indices shall be imposed on all Distribution Utilities:

(a) System Average Interruption Frequency Index (SAIFI);

(b) System Average Interruption Duration Index (SAIDI);

(c) Customer Average Interruption Duration Index (CAIDI); and

(d) Momentary Average Interruption Frequency Index (MAIFI).

SAIFI – System Average Interruption Frequency Index

Indicates how often the average Customer experiences Sustained Interruption over a predefined period of time.

$$\frac{\sum \text{Total Number of Customers Interrupted}}{\text{Total Number of Customers Served}}$$

SAIDI – System Average Interruption Duration Index

Indicates the total duration of Interruption for the average Customer during predefined period of time. It is commonly measured in Customer minutes or Customer hours of Interruption.

$$\frac{\sum \text{Customer Interruption Duration}}{\text{Total Number of Customers Served}}$$

CAIDI – Customer Average Interruption Duration Index

Represents the average time required to restore service.

$$CAIDI = \frac{\sum Customer\ Interruption\ Duration}{Total\ Number\ of\ Customers\ Served} \quad \frac{Total\ Number\ of\ Customers\ Served}{\sum Total\ Number\ of\ Customers\ Interrupted}$$

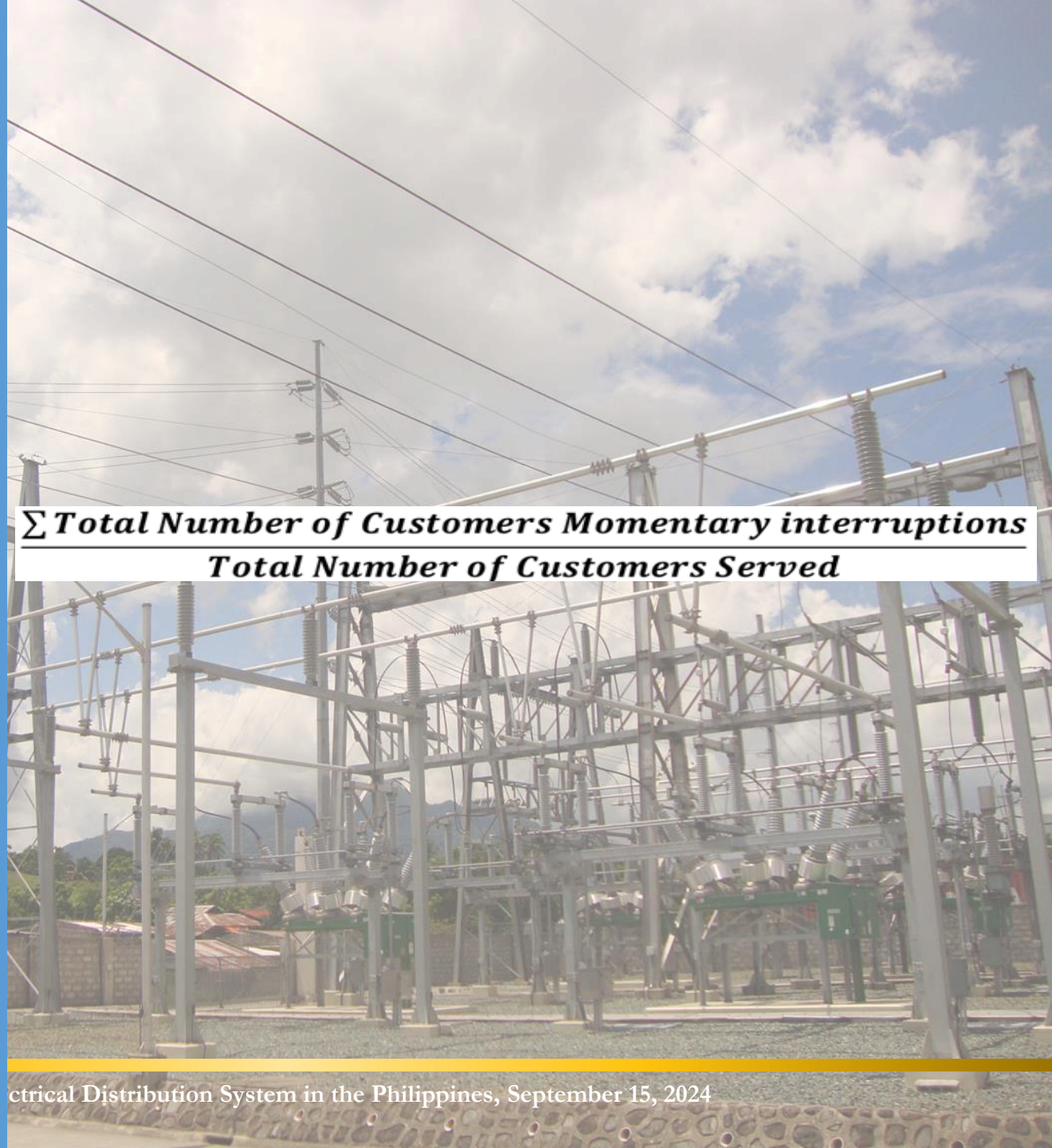
$$SAIDI \qquad \frac{I}{SAIFI}$$

$$CAIDI = \frac{SAIDI}{SAIFI}$$

MAIFI – Momentary Average Interruption Frequency Index

Indicates the average frequency of Momentary Interruptions.

$$\frac{\sum \text{Total Number of Customers Momentary interruptions}}{\text{Total Number of Customers Served}}$$



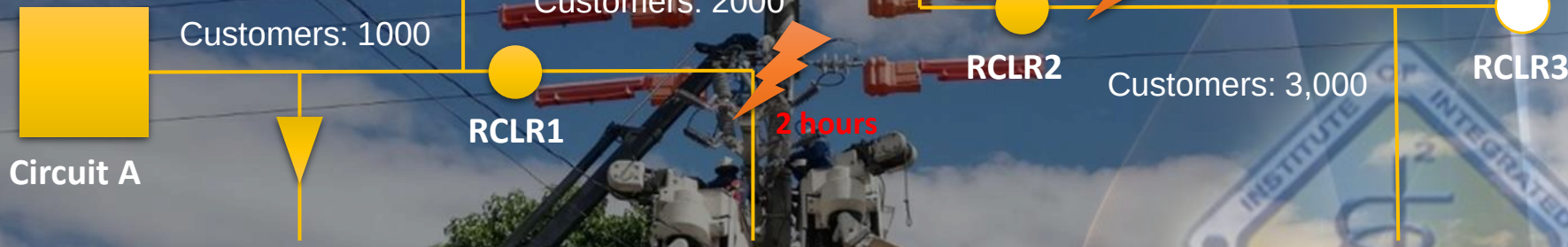
3.3.3 Inclusions and Exclusions of Interruption Events

3.3.3.1 A power interruption shall include any Outage in the primary distribution system, extending from the distribution substation to the distribution Transformers, which may be due to the tripping action of protective devices during faults or the failure of primary distribution lines and/or Transformers, and which results in the loss of service to one or more Customers or Users.

Excluded events

- ERC recognises that
  - Some events occur on other part of electricity chain
  - Some events are so extreme that the capacity of an efficient utility to deal with these are exceeded
- There is therefore allowance for events to be excluded from reliability measurements, for example:
  - supply interruptions made at the request of a customer;
  - load shedding due to a shortfall in generation;
  - supply interruptions caused by a failure of the transmission network;
  - supply interruptions caused by a failure of a transmission connection asset, but only to the extent that the interruptions were not due to inadequate planning of transmission connections; and
  - widespread supply interruptions due to rare and extreme events.

Source: ERC



$$SAIFI = \frac{\sum Total\ Number\ of\ Customers\ Interrupted}{Total\ Number\ of\ Customers\ Served}$$

$$SAIFI = \frac{2000 + 3000}{6000}$$

$$SAIFI = 0.83\ times$$

$$SAIDI = \frac{\sum Customer\ Interruption\ Duration}{Total\ Number\ of\ Customers\ Served}$$

$$SAIDI = \frac{2000 * 2 + 3000 * 4}{6000}$$

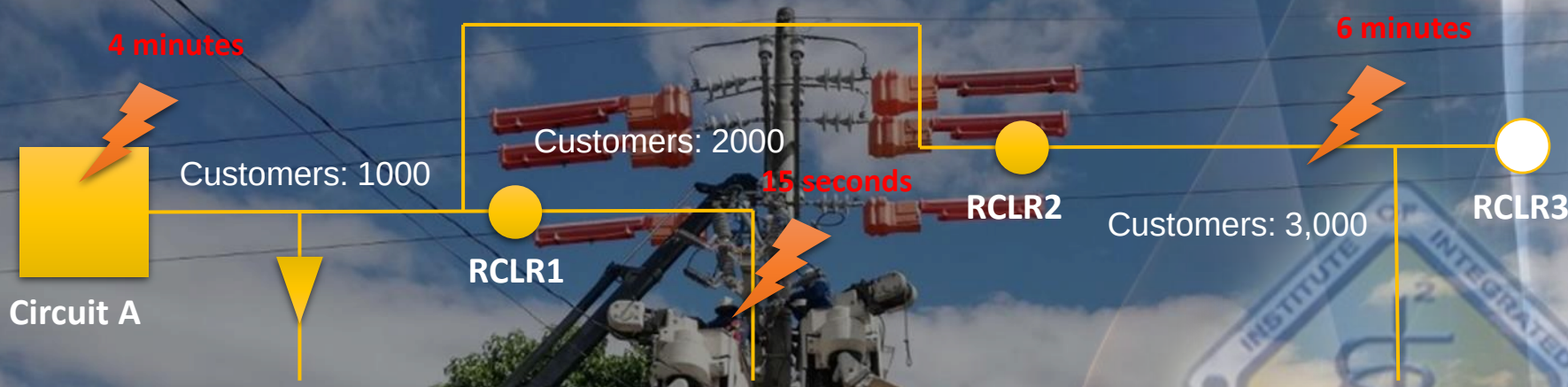
$$SAIDI = 2.67\ hours$$

$$CAIDI = \frac{\sum Customer\ Interruption\ Duration}{Total\ Number\ of\ Customers\ Interrupted}$$

$$CAIDI = \frac{SAIDI}{SAIFI}$$

$$CAIDI = \frac{2.67\ hrs}{0.83\ times}$$

$$CAIDI = 3.20\ hours$$



$$MAIFI = \frac{\sum Total\ Number\ of\ Customers\ Momentary\ Interruption}{Total\ Number\ of\ Customers\ Served}$$

$$MAIFI = \frac{6000 + 2000}{6000}$$

$$MAIFI = 1.33\ times$$

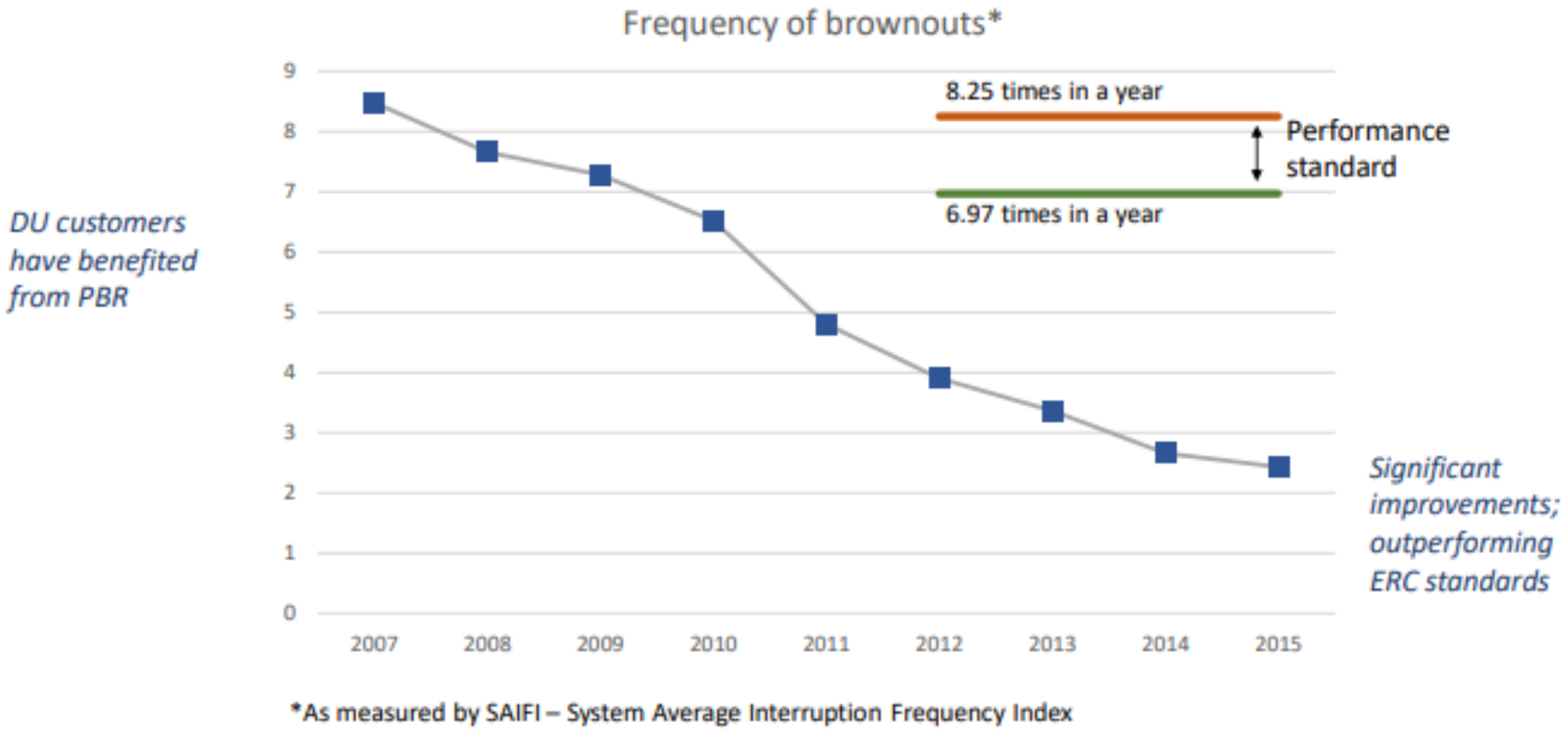
Customer-specific Performance Incentive Scheme (GSL Factor)

- Guaranteed Service Level (GSL) rebates to individual customers where DU fails to keep within threshold
- If DU does not improve, it is expected that DU will pay-out all GSL allowance

Performance Measure	Threshold	Pay-out level (PhP)
GSL1 : Customer experiencing a cumulative duration of sustained service interruptions in a Regulatory Year that exceeds the threshold	35 hours	P 299.06
GSL2 : Customer experiencing a total number of sustained service interruptions in a Regulatory Year that exceeds the threshold	25 times	P 299.06
GSL3 : Restoration of supply to a customer after a fault on the secondary distribution network taking longer than the threshold time	15 hours	P 299.06

Source: ERC

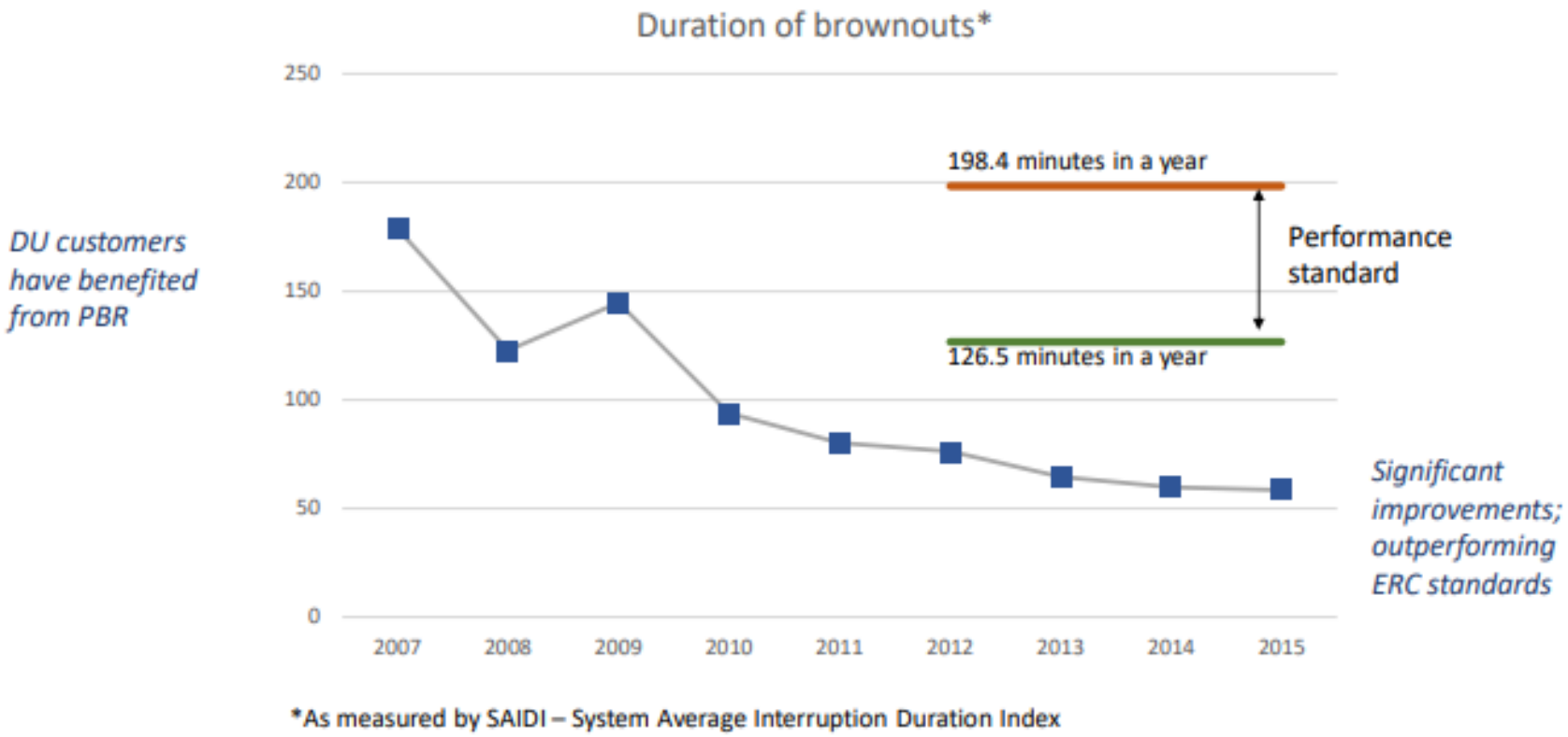
Customers have benefited from PBR. It has led to fewer average number of brownouts experienced by consumers.



Source: ERC

Meralco experience

Customers have benefited from PBR. It has led to shorter average length of brownouts experienced by consumers.

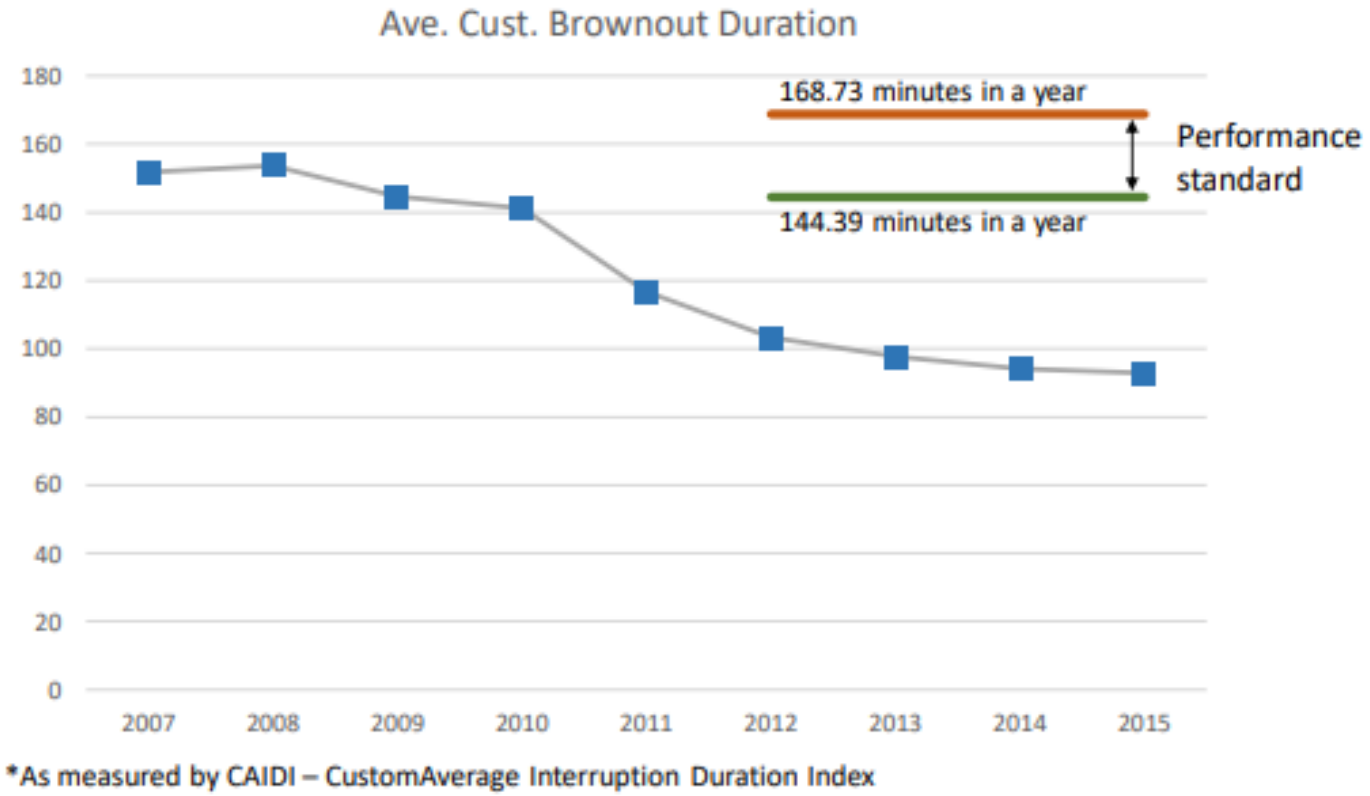


Source: ERC

Meralco experience

Customers have benefited from PBR. It has led to shorter average duration of brownouts experienced by consumers.

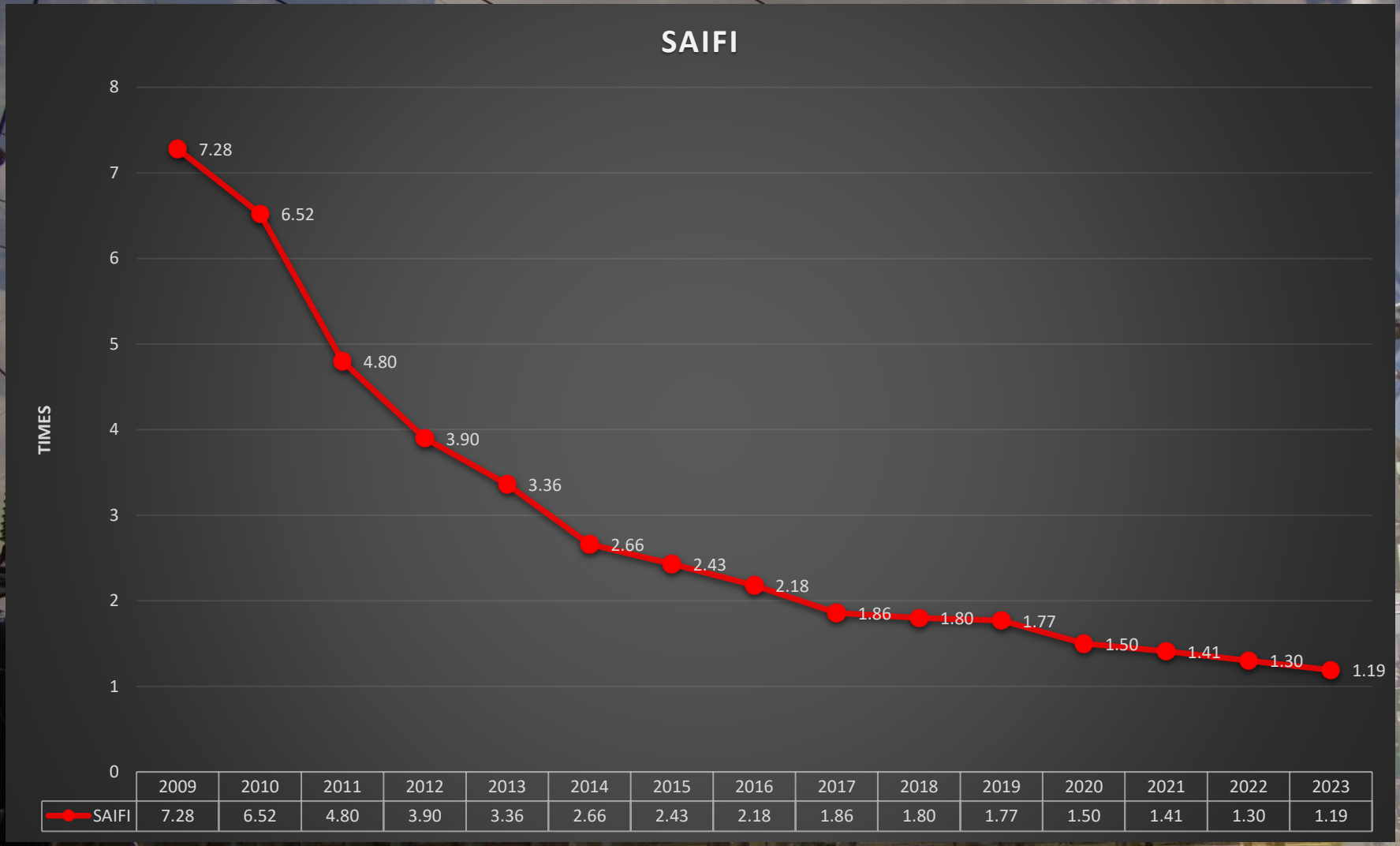
DU customers have benefited from PBR



Source: ERC

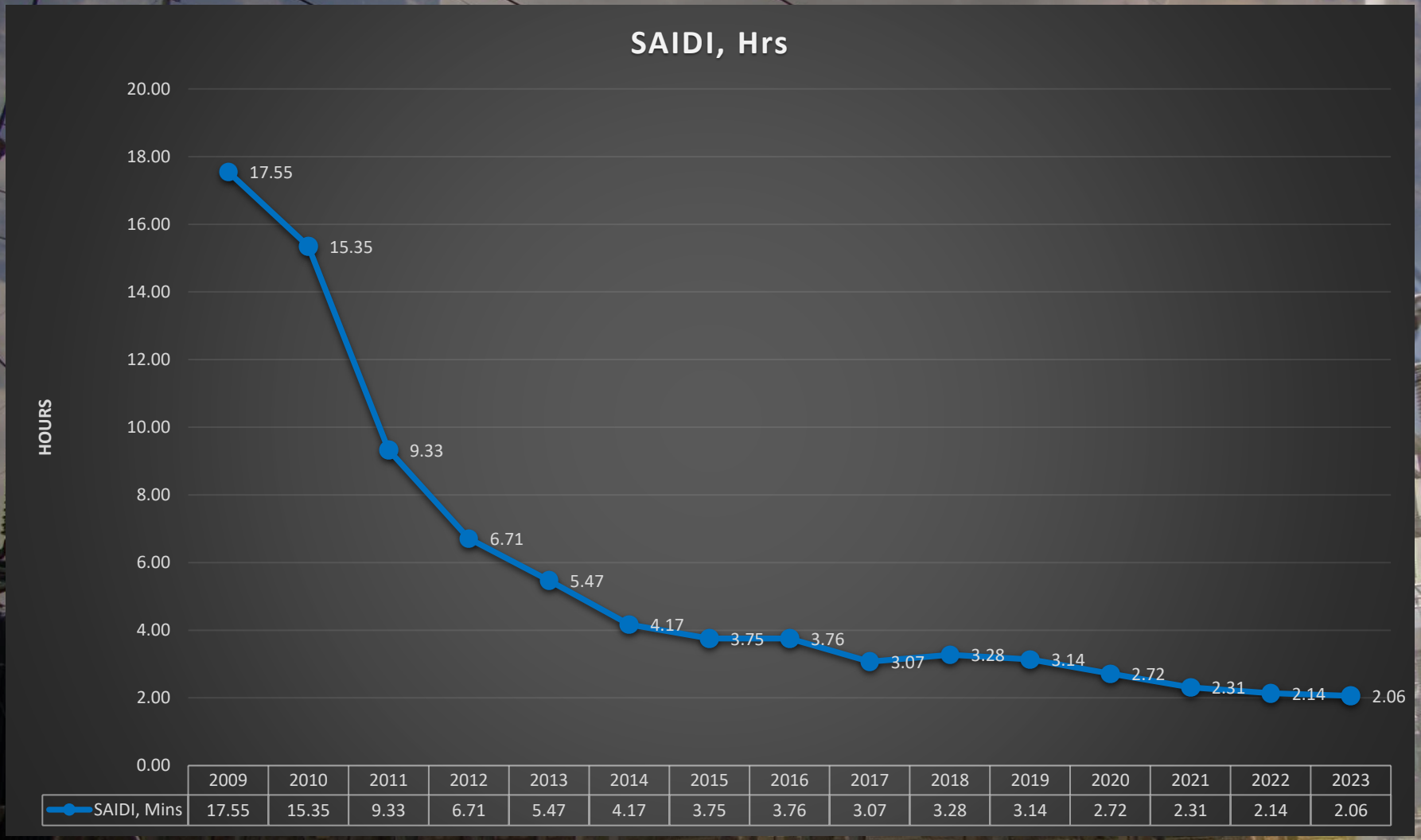
Meralco experience

2023 Meralco Data



	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
SAIFI	7.28	6.52	4.80	3.90	3.36	2.66	2.43	2.18	1.86	1.80	1.77	1.50	1.41	1.30	1.19

2023 Meralco Data



	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
SAIDI, Mins	17.55	15.35	9.33	6.71	5.47	4.17	3.75	3.76	3.07	3.28	3.14	2.72	2.31	2.14	2.06

Performance Data of MERALCO, VECO & DLPC.

SAIFI is occurrences per year, while for SAIDI its minutes per year.

For the basis of performance, outages are classified into planned and unplanned outages. The data below are outages within the DUs control. Excluded in the computations are outage due to Power Supplier (NGCP/GenCO) and due to Major Storm Disaster. The reference report for the data below is the submitted Monthly Interruption Report (MIR) of DUs to the ERC.

System Average Interruption Frequency Index (SAIFI) – Unplanned

No.	PDU	ISLAND	2017	2018	2019	2020	2021	2022
1	MERALCO	Luzon	1.5659	1.4462	1.4101	1.2278	1.07	0.98
2	VECO	Visayas	1.0439	1.2341	2.4754	1.8110	1.65	1.45
3	DLPC	Mindanao	4.2399	5.6658	7.0845	2.7282	3.49	5.17

System Average Interruption Frequency Index (SAIFI) – Planned

No.	PDU	ISLAND	2017	2018	2019	2020	2021	2022
1	MERALCO	Luzon	0.288	0.308	0.359	0.279	0.34	0.34
2	VECO	Visayas	0.039	0.837	0.893	0.781	1.14	0.60
3	DLPC	Mindanao	2.315	1.247	2.313	1.211	3.39	1.94

System Average Interruption Duration Index (SAIDI) – Unplanned

No.	PDU	ISLAND	2017	2018	2019	2020	2021	2022
1	MERALCO	Luzon	130.4439	137.7599	123.4462	110.4986	79.74	69.09
2	VECO	Visayas	28.8542	119.5821	230.6297	213.4483	175.15	119.68
3	DLPC	Mindanao	341.0652	242.8201	474.7533	224.0325	204.22	303.10

System Average Interruption Duration Index (SAIDI) – Planned

No.	PDU	ISLAND	2017	2018	2019	2020	2021	2022
1	MERALCO	Luzon	53.6449	50.6857	62.9109	53.8939	59.72	61.54
2	VECO	Visayas	10.3204	255.0852	276.9163	191.5338	211.43	123.52
3	DLPC	Mindanao	29.3881	34.2214	82.0851	89.0686	67.59	117.85

Source: ERC

2022 System Reliability Summary

	Distribution Utilities	Classification	No. of Report	ALL OTHERS			SCHEDULED			POWER SUPPLY			MAJOR STORM		
				SAIFI	SAIDI	MAIFI	SAIFI	SAIDI	MAIFI	SAIFI	SAIDI	MAIFI	SAIFI	SAIDI	MAIFI
REGION III (CENTRAL LUZON)															
21	**AEC**	PDU	12	8.683	397.097	3.5107	4.029	476.544	0.0000	2.844	54.279	0.0002	0.000	0.000	0.0000
*22	AURELCO	ECDU	12	6.820	642.643	8.9950	7.278	662.531	1.0364	13.666	4,624.958	10.4883	3.345	5,180.525	0.9619
23	**CEDC**	PDU	12	2.067	179.343	0.0188	0.678	215.497	0.0000	0.000	0.000	0.0000	0.000	0.000	0.0000
24	**CELCOR**	PDU	12	4.030	276.287	5.0223	2.350	1,057.727	7.8608	1.016	159.505	0.0000	1.029	1,828.107	0.7803
25	NEECO I	ECDU	12	4.429	211.227	8.0510	3.218	656.840	1.0259	15.903	2,447.303	6.0924	2.701	6,577.010	0.5858
26	NEECO II-Area I	ECDU	12	8.944	834.783	1.9887	3.421	1,204.402	0.7210	14.459	2,914.629	6.3834	1.279	1,368.957	0.0000
27	NEECO II-Area II	ECDU	12	12.199	459.007	25.8765	6.715	1,817.216	5.3255	13.985	3,882.415	19.1520	0.991	2,678.299	0.0651
28	**OEDC (PUD)**	PDU	12	3.706	194.855	0.9334	4.724	335.475	0.8192	5.015	622.431	0.0000	0.303	11.668	0.0818
29	PELCO I	ECDU	12	5.073	255.108	1.2176	5.832	1,631.092	0.1410	4.205	824.715	0.0000	2.254	461.632	0.2966
30	PELCO II	ECDU	12	10.685	613.357	3.1340	5.764	1,426.518	2.3247	6.043	1,441.317	0.0000	5.453	798.704	1.4734
**31	PELCO III	ECDU	12	5.845	104.805	6.2284	4.957	880.251	1.0402	12.330	1,091.243	0.0000	0.399	4.817	0.2636
32	PENELCO	ECDU	12	3.344	203.771	0.6098	1.241	330.650	0.0178	8.829	601.415	0.3183	0.558	70.522	0.0578
34	PEZA BEZ		0												
33	PRESCO	ECDU	12	3.011	282.486	5.8515	1.985	883.369	0.0000	10.013	484.744	0.9999	1.012	12.145	2.0242
34	SAJELCO	ECDU	6	0.633	44.017	6.9868	0.885	77.797	0.5344	13.021	3,506.289	8.0218	0.000	0.000	0.0000
35	**SFELAPCO**	PDU	12	4.638	283.174	2.0832	0.879	49.082	1.2002	6.071	783.057	0.0877	0.000	0.000	0.0000
36	**SUBIC EZ**	PDU	12	3.647	117.682	3.1697	0.396	93.764	0.3351	0.000	0.000	0.0000	0.063	11.607	0.0298
37	TARELCO I	ECDU	12	12.457	620.666	40.6802	2.118	557.249	0.0000	30.823	6,164.493	4.9665	3.191	304.413	1.0450
38	TARELCO II	ECDU	12	6.654	279.905	34.9105	1.483	328.881	1.7523	5.457	1,367.426	0.5283	4.835	1,263.948	3.0383
39	**TEI**	PDU	12	6.704	259.581	7.2955	3.051	426.582	3.1726	3.968	644.133	0.3834	1.061	2,040.955	0.4534
40	ZAMECO I	ECDU	12	15.593	867.130	86.1043	1.898	552.304	0.8277	13.759	2,157.464	7.8078	4.733	471.163	9.1829
41	ZAMECO II	ECDU	12	7.802	186.722	21.4827	2.752	260.680	1.4948	36.300	1,683.883	5.4857	4.260	400.932	2.2171
National Capital Region (NCR)															
42	**MERALCO**	PDU	12	0.980	69.090	8.5272	0.338	61.541	0.5986	1.373	20.938	0.3378	0.396	263.545	1.4944
REGION IV-A (CALABARZON)															
43	BATELEC I	ECDU	12	6.658	506.218	20.2588	1.440	370.595	0.0000	23.509	3,999.091	0.4456	0.000	0.000	0.0000
44	BATELEC II	ECDU	12	7.653	770.464	9.7679	5.425	1,304.395	1.0431	11.777	3,091.729	0.5924	1.350	206.958	0.4102
*45	**FBPC (BELS)**	PDU	12	5.848	599.708	0.3175	5.278	1,483.902	0.0000	0.000	0.000	0.0000	1.087	1,698.337	0.0000
46	FLECO	ECDU	12	5.310	167.129	17.9190	4.635	1,040.411	1.9297	13.100	2,479.394	1.4659	2.057	535.510	1.6581
47	**IEEC**	PDU	12	14.436	417.697	9.5933	0.000	0.000	0.0000	11.867	2,998.215	0.0000	0.000	0.000	0.0000
48	**LEZ (LUC)**	EZ	0												
**49	**PEZA CEZ**	EZ	0												
50	QUEZELCO I	ECDU	12	7.995	434.923	41.6016	5.250	2,033.539	0.0507	19.059	5,555.278	0.7390	0.957	175.393	0.9571
51	QUEZELCO II	ECDU	12	3.001	193.801	20.2289	0.385	37.064	0.0000	32.964	8,984.852	13.6679	2.661	1,639.369	2.9345

Source: ERC

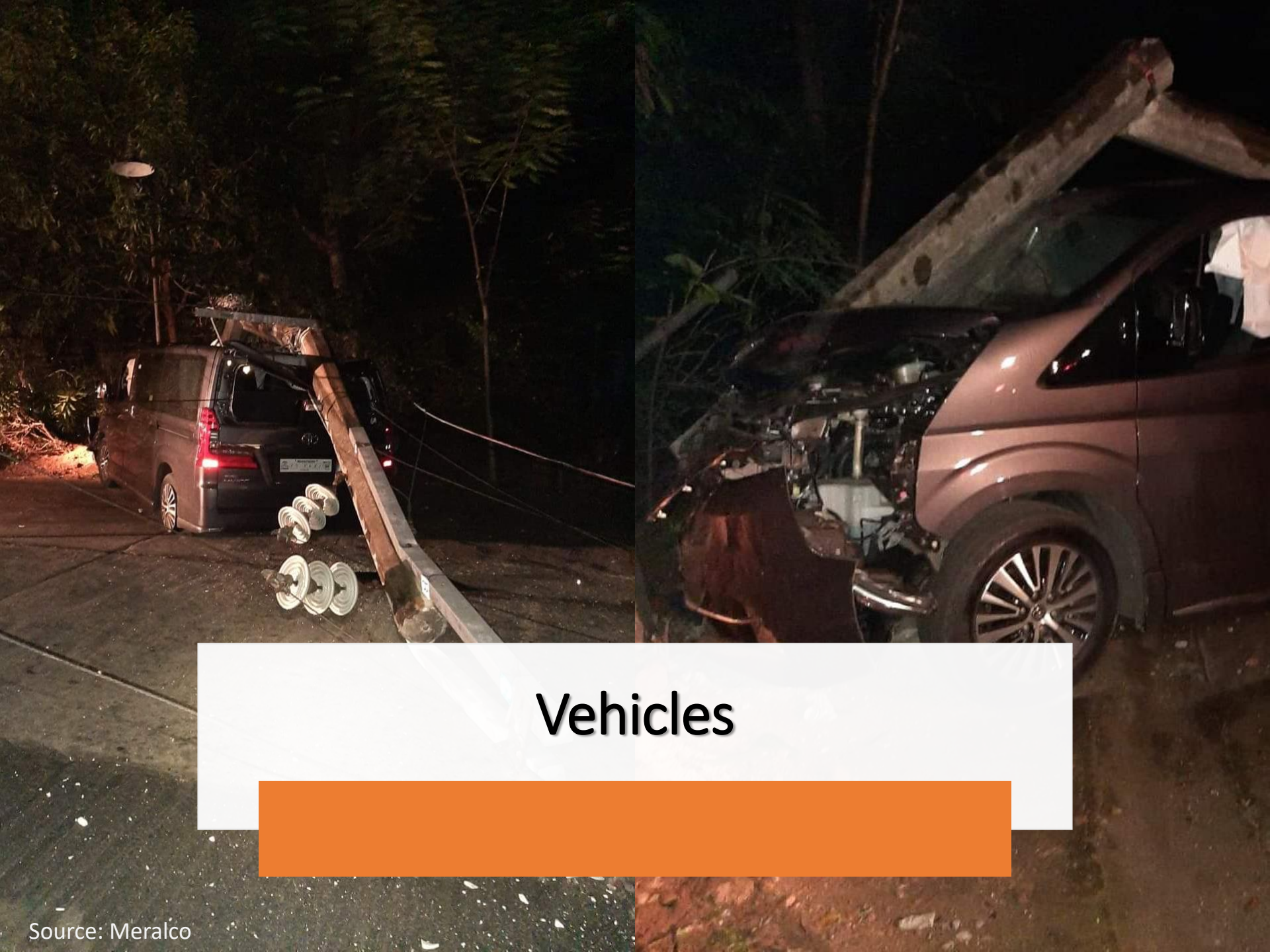
Weather

Weather

Source: Meralco

Weather

Source: Meralco



Vehicles

Source: Meralco

Vehicles

Source: Meralco

Trees

Source: Meralco

Trees

Source: Meralco

Animals

Source: Meralco

Animals

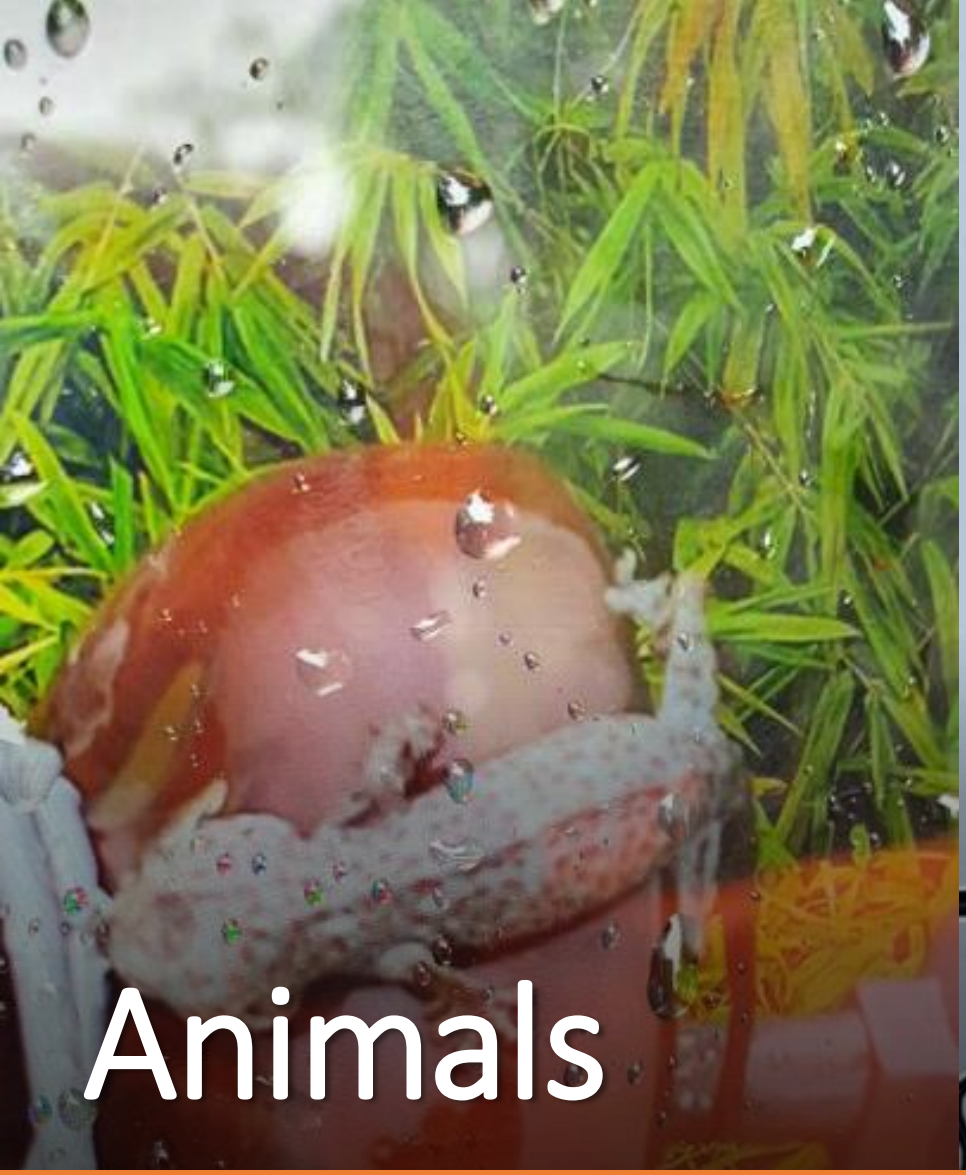
Source: Meralco

Animals

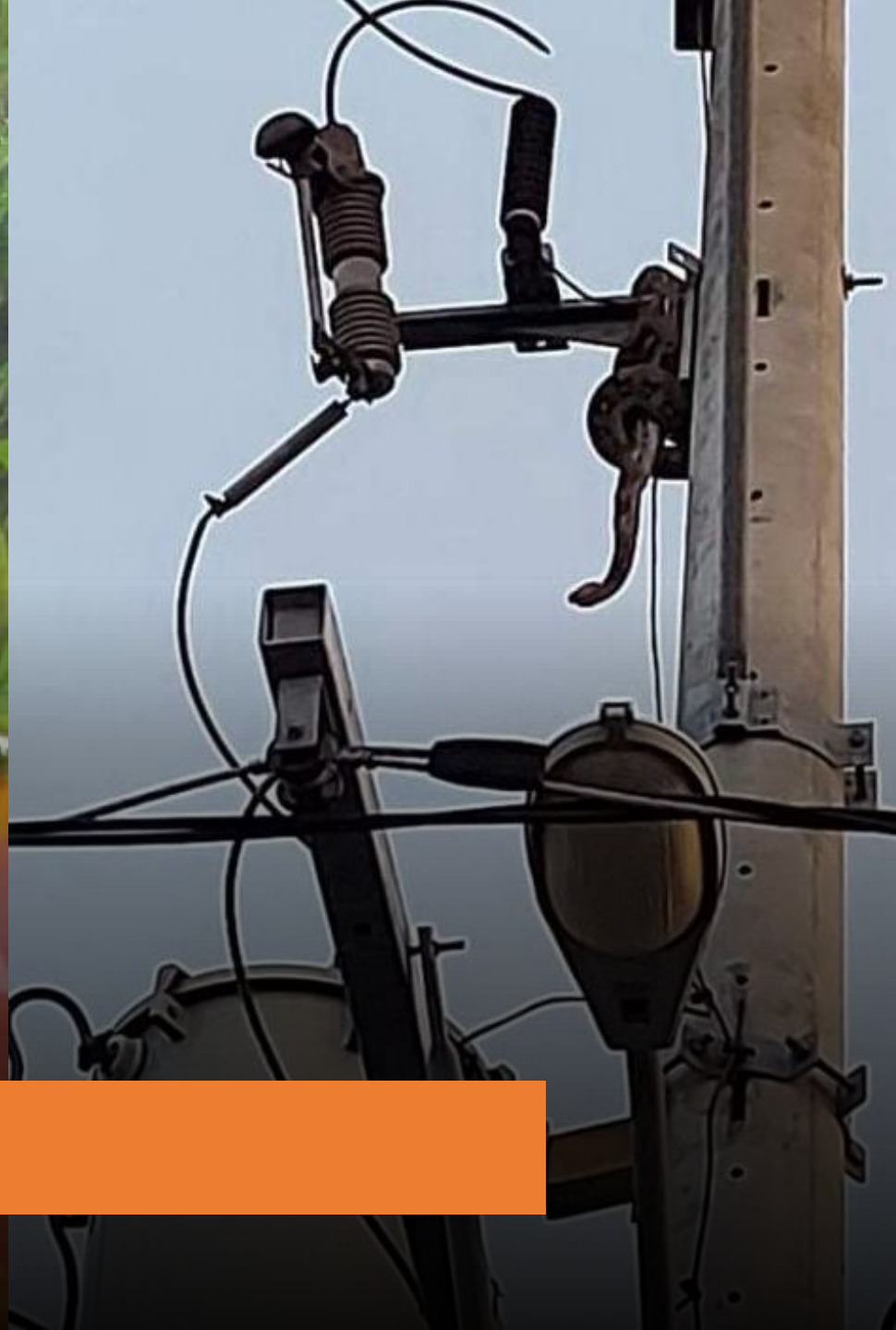
Source: Meralco

Animals

Source: Meralco



Animals



Source: Meralco

Other Object

Source: Meralco

Other Object

Source: Meralco

Source: Meralco

Other Object

Other Object

Source: Meralco

Other Object

Source: Meralco

Other Objects

Source: Meralco

Other Objects

Source: Meralco

Maintenance Activities

1. Conduct thermal scanning (infrared thermography) of distribution lines and facilities.
2. Conduct pole grounding resistance test
3. Conduct regular pole line inspection
4. Removal of foreign objects
5. Tree pruning/trimming
6. Installation of animal deterrence/clearance
7. Replacement of pin/contaminated insulators
8. Public information awareness on working near power lines and equipment

Activities to Improve Reliability

Detection and Correction of overheating components

Source: Meralco

Pole Grounding
Resistance Testing

Activities to Improve Reliability

Activities to Improve Reliability

Tree Trimming

Pole Inspection

Activities to Improve Reliability

DT Load Testing

Activities to Improve Reliability

Activities to Improve Reliability

Animal Deterrence

Additional clearance

Bird spikes

Reduce the trouble due to animals but cannot totally eliminate

Source: Meralco

Activities to Improve Reliability

Animal Deterrence

Snake Cones

Reduce the trouble due to animals but cannot totally eliminate

Source: Meralco

Projects for Improvement of Reliability

1. Additional Substations
2. Additional Sub-transmission Lines
3. Installation of Automatic Circuit Reclosers
4. Installation of Overhead Static Wire and Lightning Arresters
5. Conversion from bare to covered overhead lines
6. Replacement of steel crossarm to fiber glass crossarm

Source: Meralco

Projects for Improvement of Reliability

Development of San Ildefonso 69 kV - 13.8 kV Substation

Energized on April 30, 2023

- San Ildefonso substation has an initial capacity of 50 MVA.
- It will serve the load growth in the municipalities of San Ildefonso and San Miguel in the province of Bulacan
- It will also address the critical loading of San Miguel banks 1 and 2.
- RY2022 Capex (PhP 328.85M)

Development of Vermosa South 115 kV - 34.5 kV Substation

Energized on May 7, 2023

- Vermosa South substation has an initial capacity of 83 MVA including a new 5-km 115 kV sub-transmission line which cuts-in to the existing Dasmarinas-Abubot-SMC-Imus Line.
- It will serve the rapidly growing demand of customers in Imus, Cavite (SM City Molino, The District Dasmarinas, Ayala Vermosa Sports Hub, and Westfield Subdivision).
- It will also relieve the critical loading of Imus bank 2.
- RY2021 Capex (PhP 481.79M)

Projects for Improvement of Reliability

Development of Arca South 115 kV - 34.5 kV GIS Substation

Energized on June 27, 2023

- Arca South GIS substation has an initial capacity of 83 MVA including a new 1.88-km 115 kV sub-transmission line tapped to the existing Sun Valley-NAIA 115 kV line.
- It will serve the rapidly growing demands of customers in Taguig, Makati and Paranaque cities (Arbor Lanes, Landers Superstore, SM Hypermarket, FTI Taguig, and Maharlika Village).
- It will also relieve the critical loading of Sun Valley banks 1 & 2, and Gardner bank 2.
- RY2020 Capex (PhP 596.59M)

Development of Balagtas 115 kV - 34.5 kV Substation

- Energized on November 29, 2023
- CAPEX Filing: RY2021 (Php 513.88 Million)
- Involves the installation of an 83 MVA power transformer bank, the construction of a new 8-km 115 kV line, and three (3) new 34.5 kV distribution feeders.
- Addresses the critical loading of Sta. Maria and Saog Substations, while increasing the capacity and improving the reliability of the distribution system in Balagtas, Bulacan, and other adjacent areas, which includes the proposed Bulacan Airport and Railway

Projects for Improvement of Reliability

Development of FBGC-2 115kV–34.5 kV GIS Substation

- Energized on December 7, 2023
- CAPEX Filing: RY2019 (PhP 413.98 Million)
- Includes the installation of 115 kV and 34.5 kV GIS and an 83 MVA power transformer, the construction of a new 0.3 km 115 kV line, and one (1) new 34.5 kV distribution feeder.
- Immediately addresses the critical loading of FBGC-4 Substation, improved switching flexibility and power quality, and reduced system loss in BGC and nearby areas.
- Provides additional capacity for vital customers such as the Shangri-la Hotel, St. Luke's Medical Center, Arthaland, Uptown, and One Residences

Development of McKinley Hill 115kV–34.5 kV GIS Substation

- Energized on December 21, 2023
- CAPEX Filing: RY2018 (PhP 440.06 Million)
- Includes the installation of 115 kV and 34.5 kV GIS and an 83 MVA power transformer, the construction of underground 115 kV lines, and two (2) new 34.5 kV distribution feeders
- Immediately addresses the critical loading of Malibay Substation, improved switching flexibility and power quality, and reduced system loss in McKinley Hill and nearby areas.
- Provides additional capacity for major customers such as the Venice Grand Mall, Enderun Colleges Inc., Commerce Industry Plaza, Science Hub, Megaworld One Legrand, 8 Upper McKinley Towers, and Megaworld Corp. World Square.

Development of Pulong Sta. Cruz 115 kV Switching Station

- Energized on September 24, 2023
- CAPEX Filing: RY2023
- Filed Cost: PhP 139.03 Million
- Involves the installation of three-phase 115 gas circuit breakers, 115 kV disconnect switches, potential transformers, and 96 kV surge arresters.
- Will improve the reliability and flexibility of existing Laguna Bel-Air – Sta. Rosa 115 kV Li The project will also cater to the high degre of service reliability and power quality requ by ePLDT's Vitro Hyperscale Data Center i Sta. Rosa, Laguna.

Projects for Improvement of Reliability

Replacement of Taguig Bank No. 1

- Energized on January 14, 2024
- CAPEX Filing: RY2023 (PhP 79.37 Million)
- A new 100 MVA power transformer was energized to replace the 40-year-old 100 MVA Taguig Bank 1.
- This project will ensure service reliability for the customers in Taguig City, Makati City, Pasig City, and the municipalities of Pateros, Cainta, and Taytay, Rizal.

Reliability Improvement of Malinta 115 kV Substation

- Energized on March 27, 2024
- CAPEX Filing: RY2021 (PhP 170.81 Million)
- This project involves the conversion of the substation's old 115 kV conventional single-bus switchyard into a modern indoor-type double bus configuration Gas Insulated Switchgear (GIS).
- This will enhance both the reliability and flexibility of the substation and the 115 kV sub-transmission system.

Uprating of Pamplona–San Pedro 115 kV Line

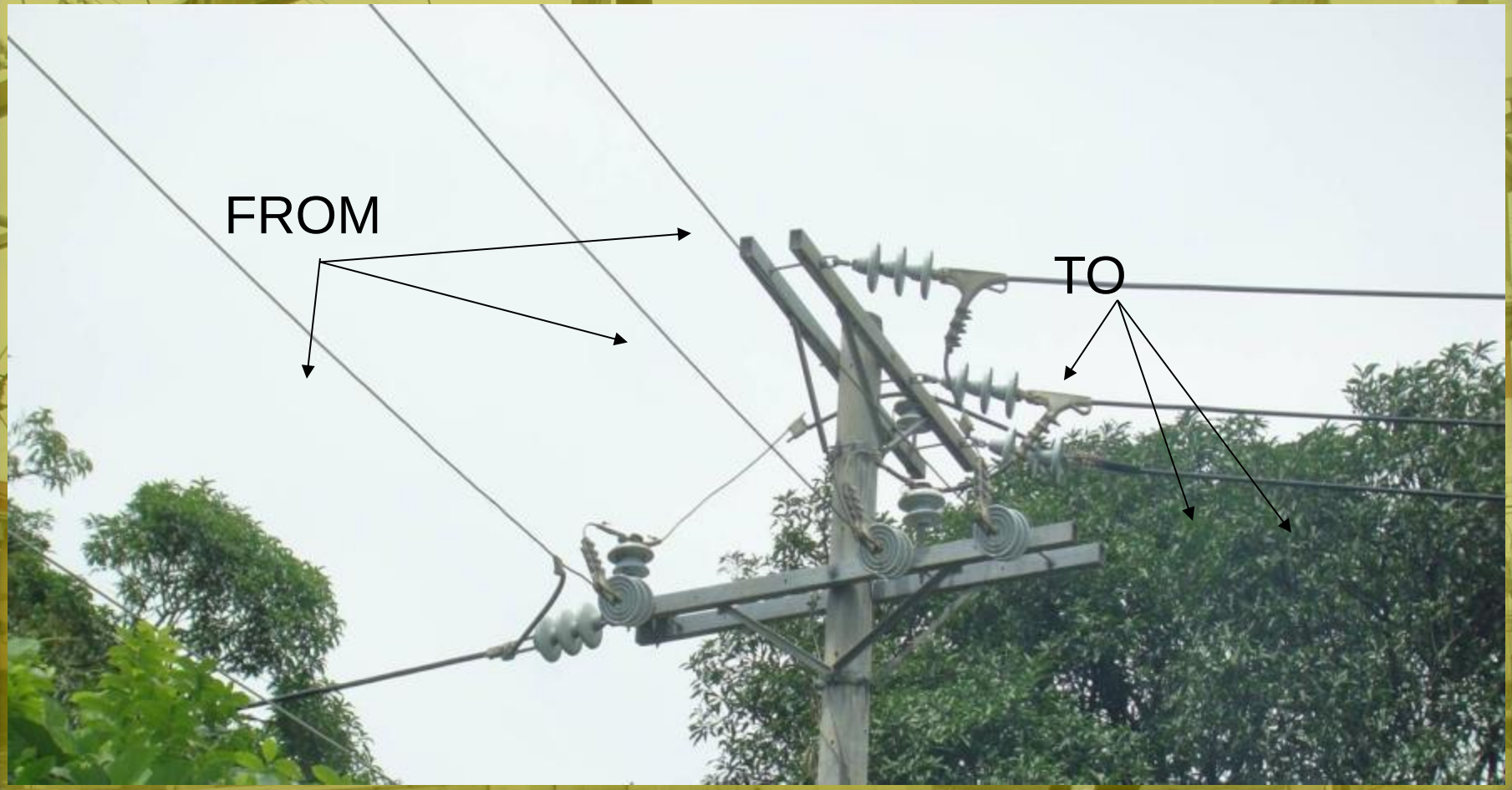
- Energized on March 21, 2024
- CAPEX Filing: RY2023 (PhP 168.70 Million)
- This project involves the uprating of 8.02 km portion of Pamplona – San Pedro 115 kV Line using 1-795 MCM HTLS along South Superhighway near Star Mall Alabang in Muntinlupa City to San Pedro Substation.
- This project will allow the accommodation of new EGs. This will also increase operational

Projects for Improvement of Reliability

Source: Meralco

Projects for Improvement of Reliability

Overhead Lines



Conversion from bare conductors to covered overhead lines

Source: Meralco

Projects for Improvement of Reliability

Installation of Fiberglass Crossarms

Source: Meralco

Projects for Improvement of Reliability

Installation of Automatic Circuit Reclosers

Viper-S Recloser w/ SEL-351R Controller

NOVA Recloser w/ Form 6 Controller

Siemens 3AD w/ Argus 7SR224 Controller

* Sample products only, not endorsing any of the brands

Source: Meralco

Projects for Improvement of Reliability

Installation of Automatic Circuit Reclosers

Source: Meralco

Projects for Improvement of Reliability

Installation of TripSaver

The TripSaver® II Cutout-Mounted Recloser combines the best of fuse-saving and fuse-blowing strategies without any of the drawbacks. When a temporary fault occurs, the TripSaver II recloser eliminates momentary outages for customers on the main feeder by only blinking the affected laterals. This lateral-protection strategy improves a utility's reliability and bottom line.

Source: S&C Electric Company

* Sample products only, not endorsing any of the brands

Projects for Improvement of Reliability

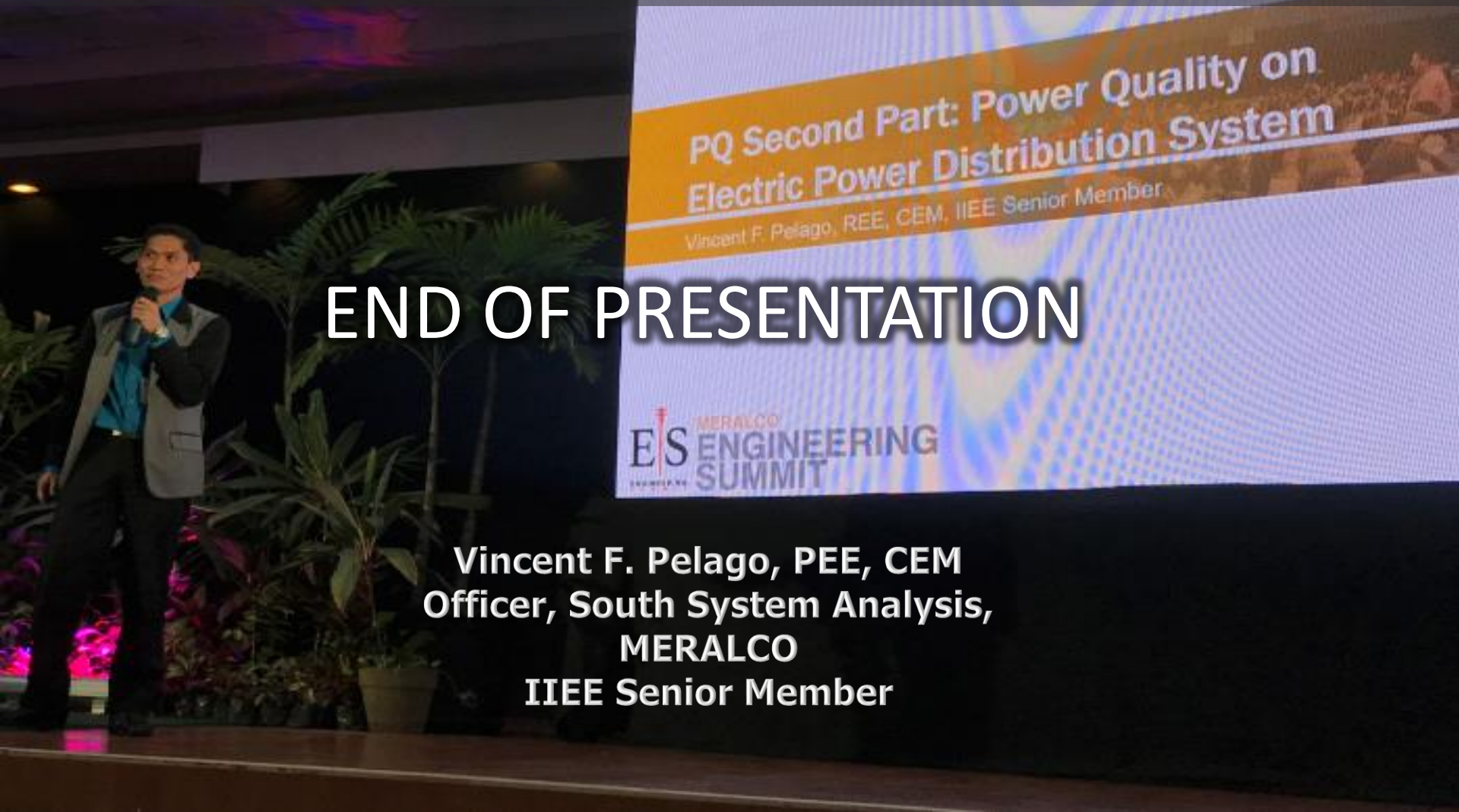
Installation of TripSaver

Source: S&C Electric Company

* Sample products only, not endorsing any of the brands

Reliability of Electrical Distribution System in the Philippines

IIEE Singapore Chapter Webinar
September 15, 2024


PQ Second Part: Power Quality on Electric Power Distribution System
Vincent F. Pelago, REE, CEM, IIEE Senior Member
MERALCO
ENGINEERING SUMMIT

END OF PRESENTATION

Vincent F. Pelago, PEE, CEM
Officer, South System Analysis,
MERALCO
IIEE Senior Member